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# PPCPs (Pharmaceuticals and Personal Care Products): **Ethinylestradiol (Estrogen)**

Ethinylestradiol, also known as estrogen, is a steroidal drug that affects the hormones in the human body. Ethinylestradiol is used to supplement or replace the body's natural estrogen. It helps to relieve many of the problems associated with the menopause, such as hot flushes, night sweats and vaginal dryness. The drug is typically prescribed for females (Chrousos 2012).

In April 2016 the ECOTOX database had 300 articles from 1970-2016 that focused of the effects of ethinylestradiol. The most common effects are feminization, gonadal development and sexual development. The most susceptible wildlife to ethinylestradiol are fish and water fleas.

**Reported effects of ethinylestradiol from toxicity literature in the ECOTOX database (as of April 2016)**

| Aquatic Life | Reported Most Common effect(s) | Reported Common study endpoint(s) | Reported Toxicity Value (LOEC, NOEC, EC50, LC50) |
|---|---|---|---|
| Zebrafish | Feminization, reduced egg production, aggressive behavior | Sex Changes, Egg Production, Behavior, Reproduction, Gonadal, Physiological, | EC50: Zebrafish: 1.04 mg/L (Schiller 2014),<br>LOEC (fertility/maturity/fecundity): 1.1 ng/L (1st generation), 2 ng/L (2nd generation)<br>NOEC: 0.72 ng/L (Rose 2002),<br>96h LC50: 1.7 mg/L (Versonnen 2003) |
| Medaka | Increased cells in liver, endocrine effects | Fertilization, Absorption, Endocrine disruption, reproduction, VTG, Liver | LOEC: 0.2 ng/L (Ma 2007),<br>EC50: Zebrafish: 1.04 mg/L (Schiller 2014),<br>LC50: None reported (Cho 2005),<br>LOEL: 0.0001 ug/L,<br>NOEL: <0.0001 ug/L (Metcalfe 2001) |
| Crustacean | Effects not visible in low concentration, low survival | survival, development and reproduction | NOEC & LOEC & LC50 (10 d & 21 d): >100 ug/L (Pounds 2002), |
| Water Fleas and other related invertebrates | No mortality, reduced fecundity, nonspecific biomarker responses | Reproduction, Endocrine, Hormones | LOEC, NOEC, LC50: >100 ug/L (Hutchinson 1999),<br>EC50 (mg/L): 0.088 (Andersen 2001) |
| Frogs | feminization, disrupted sexual development, sex reversal, | Sexual Development, Sex ratio, gonadal | LC50 (R. pipens-2 wks): Development: 3.01 uM (stage 26), 4.17(stage 36), Post-Hatch: 2.75 uM / R. slyvatica: 1.89 uM/ (Hogan 2006)<br>EC50: 7.7 ug/L (Thompsett 2013) |
| Other fishes | Lower sperm count, feminization, diminished survival | Gene expression, development, reproduction, hormones | LOEC: 1.0 ng/L (Experiment 1), 7.6 ng/L (Experiment 2) /<br>NOEC: 0.21 ng/L (Experiment 1), 1.1 ng/L (Experiment 2) (Thorpe 2003) |
| Alligator | significant female gonadal differentiation at low dosage, low hatching rate | Developmental, sex determination, hatch rate | Significant effects occurred at low dosage (0.1 and 0.3 mg/kg and ug/kg)(Matter 1998) |

Chrousos, G.P. (2012) The gonadal hormones and inhibitors *in* B.G. Katzung, S.B. Masters. A.J. Trevor, 12 Eds. Basic and clinical pharmacology. McGraw Hill. New York, NY, pp. 719